



Mobile Intel® Pentium® III Processor-M

Performance Brief

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Executive Summary

The Mobile Intel® Pentium® III Processor-M is Intel's most advanced and powerful processor for notebook PCs, offering several new features for maximum performance, productivity, and manageability. With all the power needed for the next generation of Internet-enabled software, the Mobile Intel Pentium III Processor-M will continue to deliver an exceptional experience for laptop users well into the future.

Using Intel's advanced 0.13-micron process technology, the Mobile Intel Pentium III Processor-M is available at speeds of 1.2 GHz, 1.13 GHz, 1.06 GHz, 1 GHz, 933 MHz, and 866 MHz while still offering lower power and long battery life. The Mobile Intel Pentium III Processor-M is also offered at 866 MHz, 850 MHz (100 MHz processor system bus), 800 MHz, 800A MHz (100 MHz processor system bus), 750 MHz, 733 MHz low voltage (LV) and 750 MHz (100 MHz processor system bus), 700 MHz (100 MHz processor system bus) ultra low voltage (ULV). Unless specifically noted the processor system bus frequency will be 133 MHz.

Mobile Pentium III Processor-M includes a number of new features such as a 512-KB L2 cache, Data Prefetch Logic, 133 MHz Processor System Bus with AGTL signaling, Enhanced Intel SpeedStep™ Technology support, and a very low power alert state called Deeper Sleep.

These features are offered in Micro-FCPGA and Micro-FCBGA package form factors. The low voltage and ultra low voltage processors will be available only in the Micro-FCBGA package. All of these technologies make it possible to offer this outstanding performance in mobile PCs available in a variety of shapes and sizes.

The Mobile Intel Pentium III Processor-M features a 512-KB L2 cache, which is twice the L2 cache size on the Mobile Intel Pentium III Processor. The larger L2 cache improves performance by increasing the cache-hit rate and reducing bus traffic to main memory. The Mobile Pentium III Processor-M features Data Prefetch Logic that anticipates data needed by an application and pre-loads it into the Advanced Transfer Cache, further increasing processor and application performance. The processor also includes extensions to memory order and reorder buffers that boost performance.

The Low Voltage Mobile Intel Pentium III Processor-M will support both a 133-MHz and 100-MHz processor system bus. The Ultra Low Voltage processor supports a 100-MHz bus. The Processor System Bus on the Mobile Pentium III Processor-M uses low voltage swing Assisted GTL (AGTL) signaling that enables high performance at low power.

The Mobile Intel Pentium III Processor-M is the next dramatic step towards achieving desktop performance. This exciting new processor, when used in conjunction with the Intel SpeedStep™ Applet Version 2.1 or equivalent software, supports Enhanced Intel SpeedStep Technology. Enhanced Intel SpeedStep Technology has two performance modes and allows real-time dynamic switching of the voltage and frequency between two performance modes based on CPU demand. This occurs by switching the bus ratios, core operating voltage, and core processor speeds without resetting the system.

The two performance modes are the Maximum Performance mode and the Battery Optimized Performance mode. The Maximum Performance mode operates at a higher frequency. The Battery Optimized Performance mode provides the best balance between performance and battery life and operates at a lower frequency.

The Mobile Pentium III Processor-M also features a new very low power alert state called Deeper Sleep, which enables the processor to retain state at a very low voltage. This greatly reduces processor power in the idle state, resulting in improved battery life.

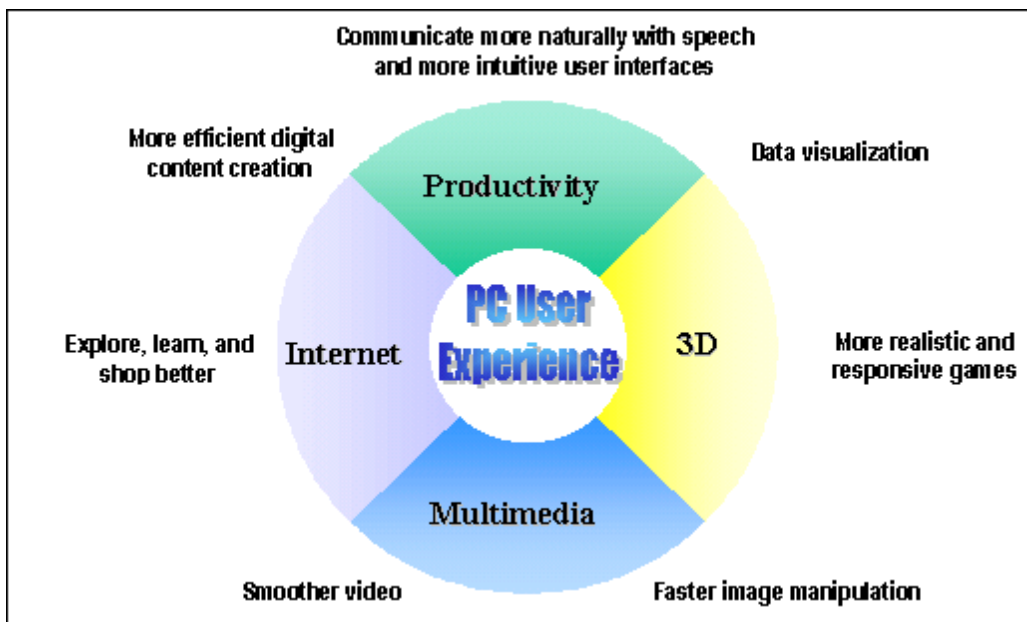
The Mobile Intel Pentium III Processor-M delivers excellent performance for all PC software and is fully compatible with existing Intel Architecture-based software. The Mobile Intel Pentium III Processor-M takes laptop power into the future by offering performance headroom for business, media, communications, and Internet applications.

Software designed for the Mobile Intel Pentium III Processor-M unleashes its full multimedia capabilities, including full-screen and full-motion video, realistic graphics, and an enhanced, exciting Internet experience.

A Mobile Intel Pentium III Processor-M used with the Intel® 830 chipset family provides a highly scalable platform from full-size notebooks to thin and light notebooks, with outstanding performance and compatibility for today's demanding applications, and plenty of headroom to remain productive for years to come. The Intel 830 chipset family has the best combination of compatibility, affordability, and performance for the demands of high-performance as well as value-based laptops. Its compatibility with the Mobile Intel Pentium III Processor-M promises to extend that track record well into the future.

Modern laptop systems are used to run a broad range of software applications. Multimedia, 3D, Productivity, and Internet application use has increased, and this trend is anticipated to continue in the future. For this reason, a wide range of benchmarks should be considered when evaluating processor and system performance. PC users and buyers should consider the entire Spectrum of Performance, which includes productivity, multimedia, 3D, and Internet performance. See Figure 1.

Figure 1. The Spectrum of Performance



Systems based on the Mobile Intel Pentium III Processor-M also include the latest features to simplify system management, decrease power consumption, and lower the total cost of ownership for large and small business environments. The Mobile Intel Pentium III Processor-M offers great performance for today and tomorrow's applications, as well as the quality, reliability, and compatibility that is expected from the world's leading microprocessor company.

This Performance Brief introduces the Mobile Intel Pentium III Processor-M, explains the technologies that make it work, examines the purpose and methods behind the industry's most useful benchmarks, and shows how the Mobile Intel Pentium III Processor-M currently performs on each. As new benchmarks are introduced, this performance brief will be updated appropriately.

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1. Introduction

The Mobile Intel Pentium III Processor-M provides exceptional power for high-performance, mainstream, thin and light, mini and sub-notebooks. It offers speed, compatibility, and reliability for today's productivity, multimedia, 3D, and Internet applications on today's operating systems. In addition, new multitasking, manageability, security, and architectural enhancements make the Mobile Intel Pentium III Processor-M the perfect choice for businesses preparing to enter the emerging Personal Enterprise Computing environment.

The Mobile Intel Pentium III Processor-M is offered at speeds of 1.2 GHz, 1.13 GHz, 1.06 GHz, 1 GHz, 933 MHz, and 866 MHz while still offering low power and long battery life. In the Maximum Performance mode, the notebook can run the most complex business and Internet applications with speeds comparable to a desktop system. In the Battery Optimized Performance mode, the Mobile Intel Pentium III Processor-M at 1.2 GHz will drop to a frequency of 800 MHz, the 1.13 GHz, 1.06 GHz, 1 GHz, and 933 MHz will drop to a frequency of 733 MHz, and 866 MHz will drop to a frequency of 667 MHz. The Low Voltage Mobile Intel Pentium III Processor-M at 866 MHz will drop to a battery-optimized frequency of 533 MHz, 850 MHz will drop to a battery-optimized frequency of 500 MHz (100 MHz processor system bus), 800 MHz will drop to a battery-optimized frequency of 533 MHz, the 800A MHz will drop to a battery-optimized frequency of 500 MHz (100 MHz processor system bus), 750 MHz will drop to a frequency of 450 MHz (100 MHz processor system bus) and the 733 MHz will drop to a frequency of 466 MHz. The Ultra Low Voltage Mobile Intel Pentium III Processor-M at 750 MHz will drop to a battery-optimized frequency of 350 MHz (100 MHz processor system bus), 700 MHz (100 MHz processor system bus) will drop to a battery-optimized frequency of 300 MHz. Unless specifically noted the processor system bus frequency will be 133 MHz. The on-demand performance switches between peak and battery-optimized modes based on user needs, optimizing application performance and battery life.

When a Mobile Intel Pentium III Processor-M is used in conjunction with the Intel 830 chipset family, the resulting platform provides reliable, balanced performance for today's mainstream notebook PCs, with headroom to remain productive as new applications emerge in the years to come.

This brief provides performance results for the following speeds of the Mobile Intel Pentium III Processor-M and Mobile Intel Pentium III Processor. A variety of benchmarks were run on each processor, and the results are normalized.

- Mobile Intel Pentium III Processor at 1.2 GHz-M
- Mobile Intel Pentium III Processor at 1.13 GHz-M
- Mobile Intel Pentium III Processor at 1.06 GHz-M
- Mobile Intel Pentium III Processor at 1 GHz-M
- Mobile Intel Pentium III Processor at 933 MHz-M
- Mobile Intel Pentium III Processor at 866 MHz-M
- Mobile Intel Pentium III Processor at 1 GHz
- Mobile Intel Pentium III Processor at 850 MHz
- Mobile Intel Pentium III Processor at 500 MHz
- Low Voltage (LV) Mobile Intel Pentium III Processor at 866 MHz-M
- Low Voltage (LV) Mobile Intel Pentium III Processor at 850 MHz-M

- Low Voltage (LV) Mobile Intel Pentium III Processor at 800 MHz-M
- Low Voltage (LV) Mobile Intel Pentium III Processor at 800A MHz-M
- Ultra Low Voltage (ULV) Mobile Intel Pentium III Processor at 750 MHz-M
- Ultra Low Voltage (ULV) Mobile Intel Pentium III Processor at 700 MHz-M
- Ultra Low Voltage (ULV) Mobile Intel Pentium III Processor at 500 MHz

When evaluating the performance of a microprocessor or system, it is important to obtain the complete performance picture. Today's PC user runs a broad spectrum of productivity, 3D, multimedia, and Internet software:

- Productivity software includes applications such as word processing, presentation, and personal finance programs.
- Multimedia software includes audio, video, imaging, and creativity applications.
- 3D software includes gaming, modeling, and simulation applications.
- Internet applications include Internet browsers, as well as 3D and multimedia Web content.

A processor and system should deliver the highest performance across the entire Spectrum of Performance including Productivity, Multimedia, 3D, and Internet.

This report provides benchmark results for the Mobile Intel Pentium III Processor-M family. Modern, industry-standard benchmarks were chosen to demonstrate capabilities across the Spectrum of Performance. The benchmarks chosen for testing include:

- The system-level benchmark BAPCo*'s SYSmark* 2001 to measure productivity performance.
- MadOnion's* Video*2000 MPEG-2 Encoding benchmark to compare multimedia performance.
- 3D Winbench* 2000 Processor Test to measure 3D performance.
- BAPCo*'s and MadOnion's* WebMark*2001 to measure Java aspects of the Internet experience.

Intel is committed to using the most robust and relevant benchmarks in characterizing the performance of its products, and Intel will adapt this mix over time as newer benchmarks are introduced into the PC market.

System performance does not depend on the microprocessor alone. Hardware and software system components—such as the operating system, the graphics and I/O subsystems, application software, and memory—may significantly affect benchmark results. For this reason, this Performance Brief illustrates Mobile Intel Pentium III Processor-M performance on a consistent system configuration. Details of the system configuration used for the benchmarks throughout this brief can be found in Appendix A.

2. Spectrum of Performance

When evaluating the performance of a microprocessor or system, it is important to obtain the complete performance picture. A processor and system should deliver high performance across the entire Spectrum of Performance: Productivity, Multimedia, 3D, and Internet.

2.1. Productivity Benchmark

Productivity software includes applications such as word processing presentation and personal finance. Popular, industry-standard productivity benchmarks include:

System Level Benchmark:

- SYSmark* 2001

2.2. Multimedia Benchmark

Multimedia benchmarks are designed specifically to represent the activities of end users working with video, audio, and imaging technologies such as MPEG-1*, MPEG-2* encoding and decoding, DVD playback, Dolby* Digital Sound, AVI, PC imaging, video conferencing, video compression, and video editing. Some benchmarks that fall under this category are:

- Video*2000 - MPEG-2 Encoding

2.3. 3D Benchmarks/Floating-Point Benchmark

The most common type of 3D application today is 3D games. Benchmarks that measure processor, 3D, and floating-point performance include:

- 3D WinBench* 2000 - Processor Test

2.4. Internet Technology Benchmark

Internet applications are evolving at a tremendous rate and include browser, 3D, and multimedia technologies. In attempting to evaluate processor Internet performance, PC users should consult the productivity, 3D, and multimedia benchmarks listed above. Additionally, some Java Internet technology benchmarks are:

System Level Benchmark:

- WebMark*2001

3. *The Mobile Intel Pentium III Processor-M*

The Mobile Intel Pentium III Processor-M offers new levels of performance and productivity for today's most demanding applications and operating systems. It incorporates advanced features to take full advantage of the Wired for Management enterprise architecture and the Personal Enterprise Computing environment that will drive business productivity to new heights in the new century.

In order to achieve near desktop performance, the Mobile Intel Pentium III Processor-M has two performance modes, Maximum Performance and Battery Optimized Performance. The Maximum Performance mode provides near desktop performance and runs at a higher frequency. The Battery Optimized Performance mode provides the best balance between performance and battery life and operates at a lower voltage. The Mobile Pentium III Processor-M supports Enhanced Intel SpeedStep Technology, which enables real-time dynamic switching of the voltage and frequency between these two performance modes based on CPU demand. This occurs by switching the bus ratios, core operating voltage, and core processor speeds without resetting the system.

The Mobile Intel Pentium III Processor-M supports Streaming SIMD Extensions, which provide dramatically faster processing and improved output on existing and next-generation applications across the entire Spectrum of Performance. This includes advanced imaging, 3D streaming audio and video, Web access, speech recognition, new user interfaces, and other cutting-edge applications.

The Mobile Intel Pentium III Processor-M is manufactured on Intel's new 0.13-micron process technology that enables a higher level of integration while lowering both power consumption and heat dissipation. A 512-KB full-speed Advanced Transfer Cache is included on the processor die itself for lower latency during cache accesses. Intelligent buffering of read/store data and a 256-bit wide cache line provide outstanding sustained concurrency and higher cache throughput, which enables higher performance. The processor provides memory cacheability for up to 4 GB of addressable memory space.

The Mobile Intel Pentium III Processor-M is available in Micro-FCBGA and Micro-FCPGA package form factors for high-volume availability, improved handling protection, and compatibility with the high-performance processors of the future.

The Mobile Intel Pentium III Processor-M is backed by over 30 years of Intel experience in manufacturing high-quality, reliable microprocessors.

4. Mobile Intel Pentium III Processor-M Product Feature Highlights

The Mobile Intel Pentium III Processor-M is fully compatible with an entire library of PC software based on operating systems such as MS-DOS*, Windows* 3.1, Windows for Workgroups* 3.11, Windows* Millennium, Windows* 98, Windows* 95, OS/2*, UnixWare*, SCO UNIX*, Windows* NT, Windows* 2000, OPENSTEP*, and Sun Solaris*. Architectural features of the Mobile Intel Pentium III Processor-M include:

- Low Power States and Enhanced Intel SpeedStep Technology Support:

The Mobile Intel Pentium III Processor-M features the Quick Start, Deep Sleep, and Deeper Sleep low power states and is offered at 1.2 GHz, 1.13 GHz, 1.06 GHz, 1 GHz, 933 MHz, 866 MHz, 850 MHz (100 MHz processor system bus), 800 MHz (133 MHz processor system bus), 800A MHz (100 MHz processor system bus), 750 MHz, and 700 MHz with Enhanced Intel SpeedStep Technology support.

Highlights of this technology include:

- ⇒ Two performance modes - Maximum Performance mode for near desktop performance, and Battery Optimized Performance mode for lower power consumption and improved battery life.
- ⇒ Real-time dynamic switching of the voltage and frequency between two performance modes based on CPU demand. This occurs by switching the bus ratios, core operating voltage, and core processor speeds without resetting the system.

- Streaming SIMD Extensions:

The Mobile Intel Pentium III Processor-M supports Streaming SIMD Extensions, including SIMD floating-point, additional SIMD integer, and cacheability control instructions. Some of the technologies that benefit from the Streaming SIMD Extensions include advanced imaging, 3D, streaming audio and video, and speech recognition applications. The benefits include:

- ⇒ Higher resolution and higher quality image viewing and manipulation
- ⇒ High quality audio, MPEG2* video, and simultaneous MPEG2 encoding and decoding
- ⇒ Reduced CPU utilization for speech recognition, as well as higher accuracy and faster response times

- Intel MMX™ Media Enhancement Technology:

Intel MMX technology is designed as a set of 57 basic, general-purpose integer instructions and four data types that are easily applied to the needs of a wide range of multimedia and communications applications. Highlights of the technology include:

- ⇒ Single Instruction, Multiple Data (SIMD) technique
- ⇒ Eight 64-bit wide MMX technology registers

- Dynamic Execution Technology:

- ⇒ Multiple branch prediction: Predicts program execution through several branches, thereby accelerating the flow of work to the processor
- ⇒ Dataflow analysis: Creates an optimized, reordered schedule of instructions by analyzing data dependencies between instructions
- ⇒ Speculative execution: Carries out instructions speculatively and, based on this optimized schedule, ensures that the mobile processor's superscalar execution units remain busy, thereby boosting overall performance

- Testing and Performance Monitoring Features:

- ⇒ Built-In Self Test (BIST) provides single stuck-at fault coverage of the microcode and large logic arrays, as well as testing of the instruction cache, data cache, Translation Lookaside Buffers (TLBs), and ROMs.
- ⇒ IEEE 1149.1 Standard Test Access Port and Boundary Scan mechanism enables testing of the Mobile Intel Pentium III Processor-M and system connections through a standard interface.
- ⇒ Internal performance counters can be used for performance monitoring and event counting.
- ⇒ Incorporates an on-die diode that can be used to monitor the die temperature. A thermal sensor located on the motherboard can monitor the die temperature of the Mobile Intel Pentium III Processor-M for thermal management purposes.
- ⇒ The Mobile Intel Pentium III Processor-M has a maximum junction temperature (T_j) specification of 100°C.
- Other significant features of the Mobile Intel Pentium III Processor-M include:
 - ⇒ High-performance Dual Independent Bus (DIB) architecture (system bus and cache bus) provides high bandwidth, performance, and scalability with future system technologies.
 - ⇒ The system bus supports multiple outstanding transactions to increase bandwidth availability.
 - ⇒ A 512-KB integrated, unified, non-blocking, level-two (L2) cache improves performance by reducing the average memory access time and by providing fast access to recently used instructions and data. Performance is boosted even further through the Full Speed Advanced Transfer Cache. This L2 cache is integrated on the processor die to minimize latency during cache accesses. Intelligent buffering and a 256-bit cache bus provide superior concurrency and throughput. This processor also incorporates separate 16-K, level-one caches—one for instructions and one for data.
 - ⇒ Data Prefetch Logic that anticipates data needed by an application and pre-loads it into the Advanced Transfer Cache. This reduces transactions between the cache and system memory reducing and/or eliminating bus cycle penalties, resulting in improved processor and application performance. The processor also includes extensions to memory order and reorder buffers that boost performance.
 - ⇒ The Mobile Intel Pentium III Processor-M supports memory cacheability for up to 4 GB of addressable memory space.
 - ⇒ The processor is available with Error Correction Code (ECC) functionality on the level-two cache bus for applications where data intensity and reliability are essential.
 - ⇒ A pipelined Floating-Point Unit (FPU) supports the 32-bit and 64-bit formats specified in IEEE standard 754 as well as an 80-bit format.
 - ⇒ Parity-protected address/request and response system bus signals with a retry mechanism ensure high data integrity and reliability.

5. Performance Summary

5.1. Productivity Benchmark

5.1.1. SYSmark* 2001

SYSmark* 2001 is a suite of application software and associated benchmark workloads developed by the Business Applications Performance Corporation (BAPCo), a non-profit consortium of leading computer industry publications, independent testing labs, PC hardware manufacturers, semiconductor manufacturers, and software publishers. SYSmark* 2001 is a tool that measures system performance on popular business-oriented applications in the Microsoft* Windows operating environment.

SYSmark* 2001 contains fourteen application workloads that are divided into two categories:

Office Productivity:

- Microsoft Word* 2000
- Microsoft Excel* 2000
- Microsoft PowerPoint* 2000
- Microsoft Access 2000
- Microsoft Outlook 2000
- Netscape* Communicator* 6.0
- Dragon* Naturally Speaking* Preferred v.5
- WinZip 8.0
- McAfee VirusScan 5.13

Internet Content Creation:

- Adobe* Photoshop* 6.0
- Adobe Premiere* 6.0
- Macromedia Dreamweaver 4
- Macromedia Flash 5
- Microsoft Windows Media Encoder* 7

Figure 2. Mobile Intel Pentium III Processor-M for SYSmark*2001 on Windows 2000 Benchmark

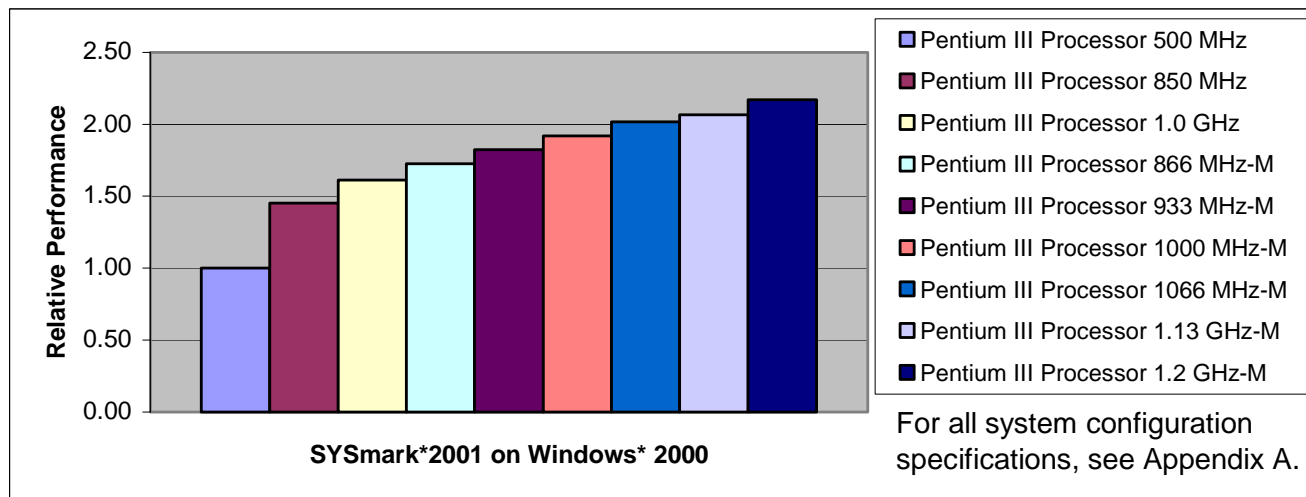


Figure 3. Low Voltage and Ultra Low Voltage Mobile Intel Pentium III Processor-M for SYSmark*2001 on Windows XP* Benchmark with Intel 440MX Platform (100 MHz Front Side Bus)

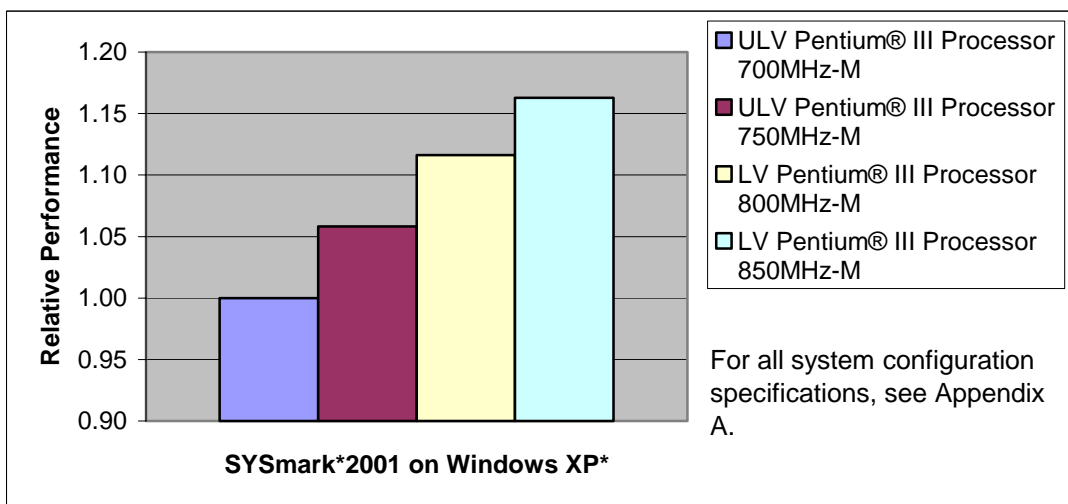
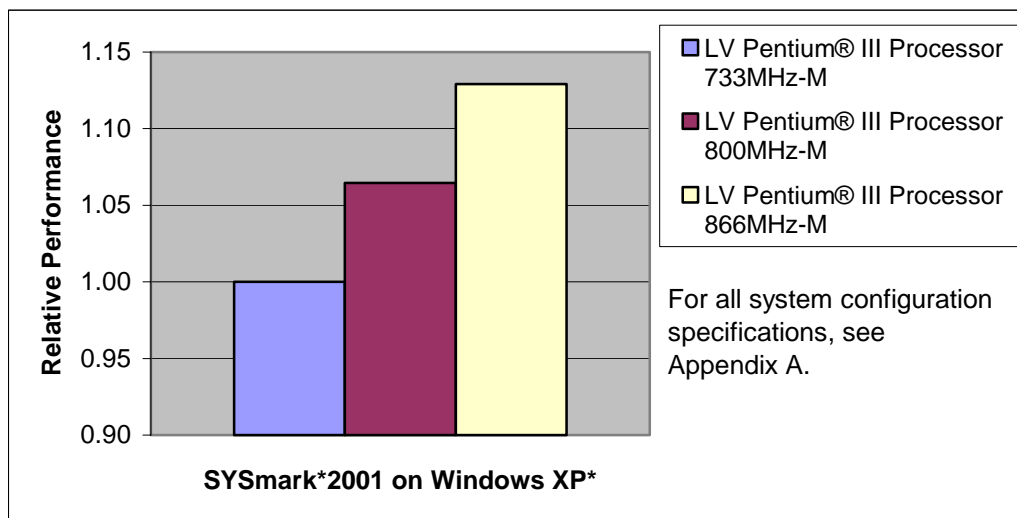


Figure 4. Low Voltage Mobile Intel Pentium III Processor-M for SYSmark*2001 on Windows XP* Benchmark with Intel 830M Platform (133 MHz Front Side Bus)

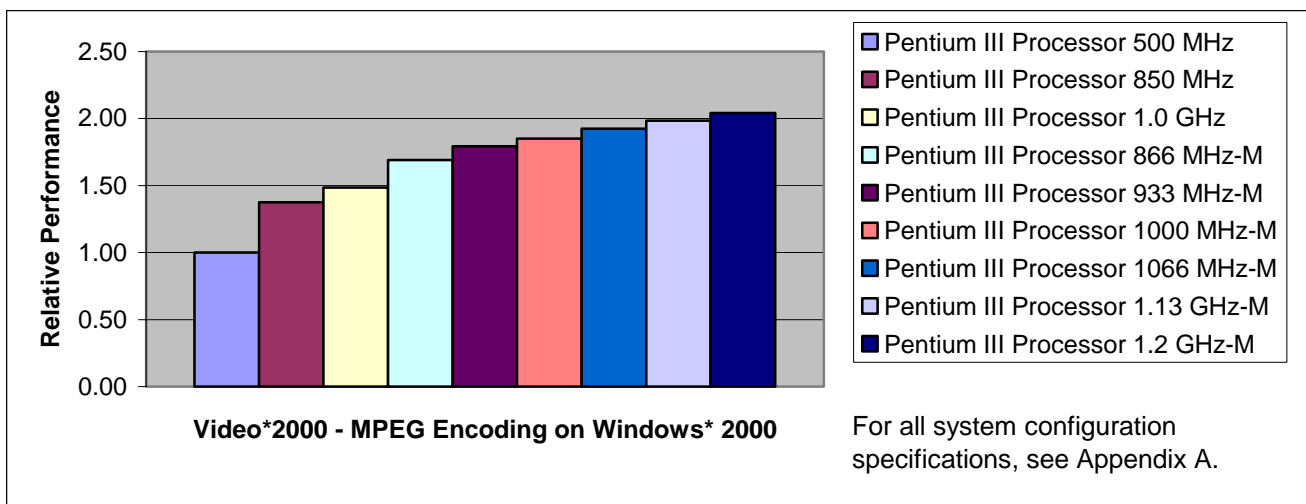


5.2. Multimedia Benchmark

5.2.1. Video*2000 – MPEG2 Encoding

One of the components of the Video*2000 performance benchmarks, MPEG-2 encoding is used in a variety of next-generation video products like home video editing, time-shifting, and DVD creation. This benchmark assesses the CPU power available to perform software-based video compression, effects, and other tasks.

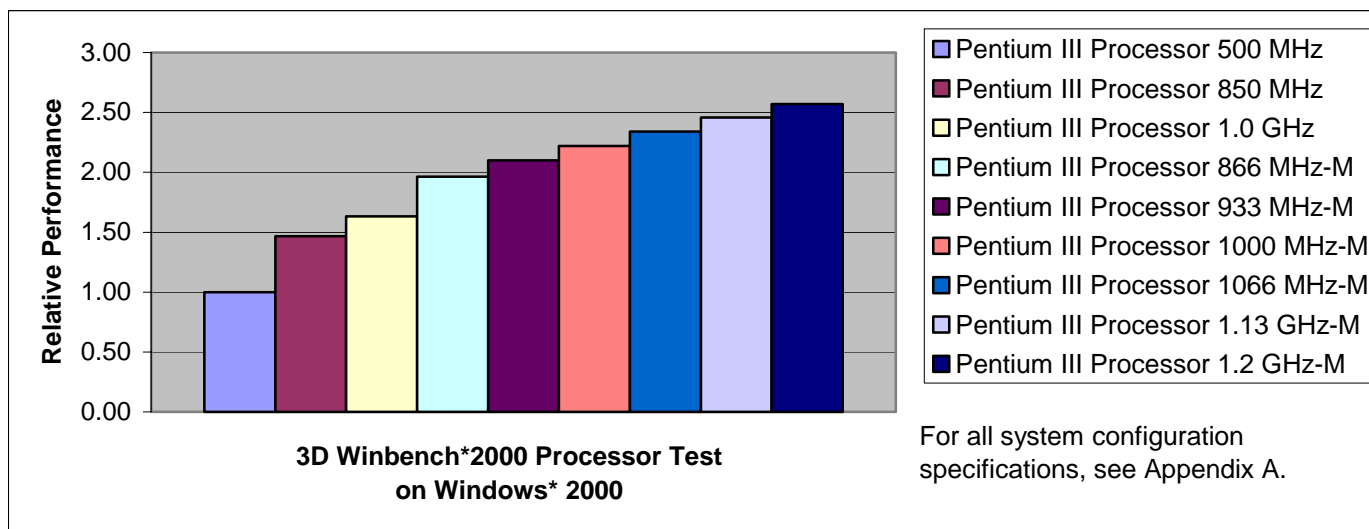
Figure 5. Mobile Intel Pentium III Processor-M Performance for the Video*2000-MPEG2 Encoding Benchmark on Windows 2000



3D Winbench* 2000 Processor Test

3D WinBench* 2000 measures system-level 3D performance, including CPU and graphics subsystem performance. To understand the processor 3D performance, the benchmark suite includes the 3D WinBench 2000—Processor Test. This benchmark measures the CPU-intensive portion of the 3D graphics pipeline.

Figure 6. Mobile Intel Pentium III Processor-M Performance for the 3D Winbench* 2000 Processor Test on Windows 2000



5.3. Internet Technology Benchmark

5.3.1. WebMark*2001

WebMark*2001 is an Internet benchmark designed and developed by Business Applications Performance Corporation (BAPCo) and MadOnion.com*. In addition to an Overall Score, WebMark2001 measures PC client performance across three different Internet usage models: Business-to-Business (B2B), Business-to-Consumer (B2C), and Intranet Business (B). WebMark2001 also measures the performance of the PC client on various technologies that are used within the benchmark, such as Flash* (operations per second), Java* (operations per second), XML (operations per second), and Video performance (frames per second).

Figure 7. Mobile Intel Pentium III Processor-M Performance for WebMark*2001 on Windows 2000

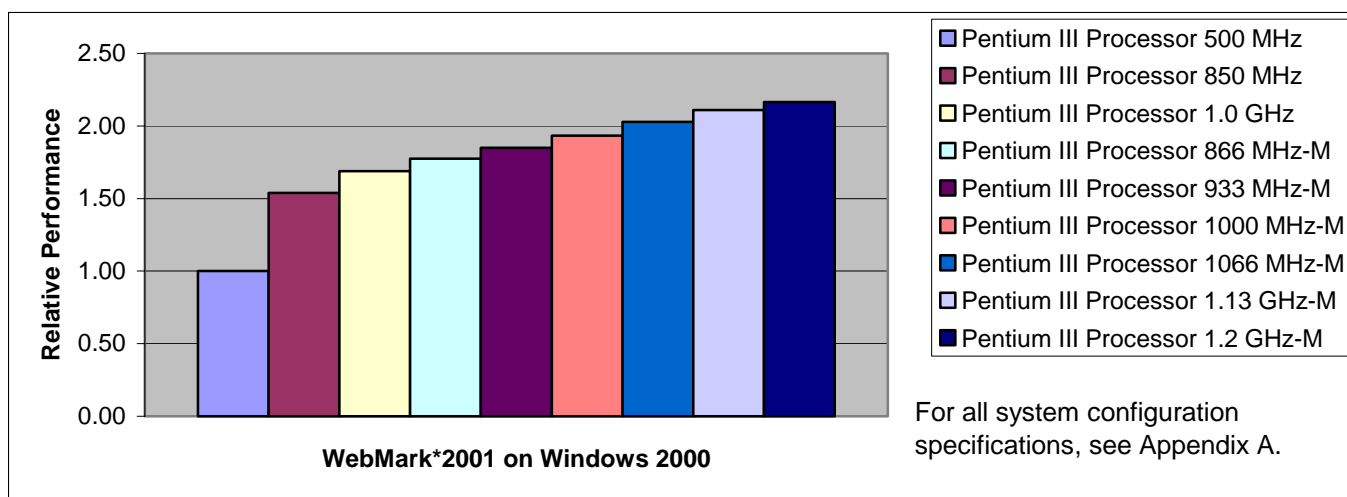


Figure 8. Low Voltage and Ultra Low Voltage Mobile Intel Pentium III Processor-M Performance for WebMark*2001 on Windows XP* with Intel 440MX Platform (100 MHz Front Side Bus).

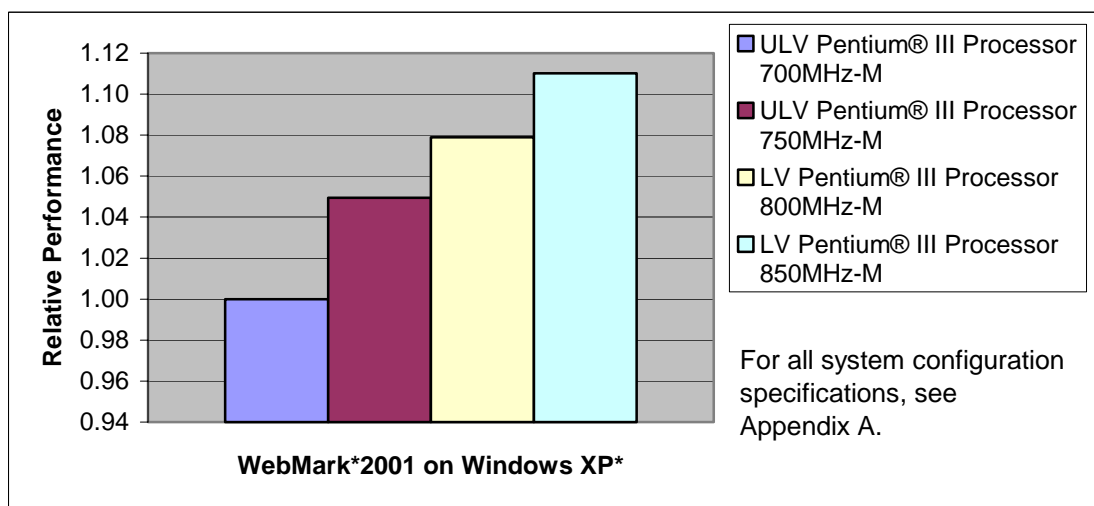
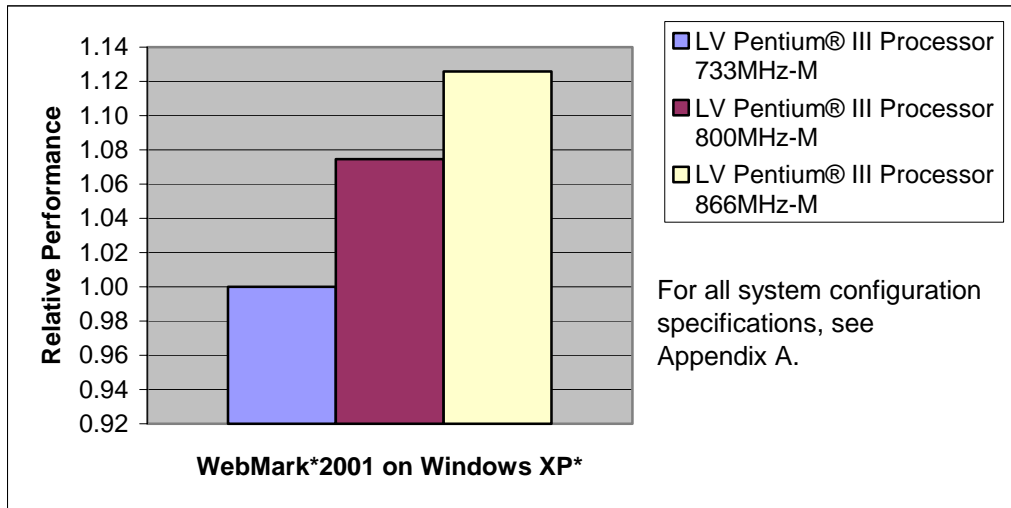


Figure 9. Low Voltage Mobile Intel Pentium III Processor-M Performance for WebMark*2001 on Windows XP* with Intel 830M Platform (133 MHz Front Side Bus)



6. Summary

Table 1 summarizes all Productivity, Multimedia, 3D Benchmarks/ Floating Point and Internet Technology benchmark performances of the Mobile Intel Pentium III Processor-M, relative to that of the Mobile Intel Pentium III Processor at 500 MHz on Windows 2000. A higher score indicates better performance.

Table 1. Spectrum of Performance Benchmark Results

Processor	Productivity	Internet Technology
	SYSmark*2001 on Windows 2000	WebMark*2001 on Windows 2000
Mobile Intel Pentium III Processor 500 MHz	1.00	1.00
Mobile Intel Pentium III Processor 850 MHz	1.45	1.54
Mobile Intel Pentium III Processor 1 GHz	1.61	1.69
Mobile Intel Pentium III Processor 866 MHz-M	1.73	1.77
Mobile Intel Pentium III Processor-M 933 MHz-M	1.82	1.85
Mobile Intel Pentium III Processor-M 1 GHz-M	1.92	1.93
Mobile Intel Pentium III Processor-M 1.06 GHz-M	2.02	2.03
Mobile Intel Pentium III Processor-M 1.13 GHz-M	2.06	2.11
Mobile Intel Pentium III Processor-M 1.2 GHz-M	2.17	2.16

Table 2 summarizes all Productivity, Multimedia, 3D Benchmarks/ Floating Point and Internet Technology benchmark performances of the Low Voltage and Ultra Low Voltage Mobile Intel Pentium III Processor-M, relative to that of the Ultra Low Voltage Mobile Intel Pentium III Processor at 700 MHz-M. A higher score indicates better performance.

Table 2. Low Voltage and Ultra Low Voltage Spectrum of Performance Benchmark Results with Intel 440MX (Front Side Bus 100 MHz)

Processor	Productivity	Internet Technology
	SYSmark*2001 on Windows XP	WebMark*2001 on Windows XP
Ultra Low Voltage Mobile Intel Pentium III Processor 700 MHz-M	1.00	1.00
Ultra Low Voltage Mobile Intel Pentium III Processor 750 MHz-M	1.06	1.05
Low Voltage Mobile Intel Pentium III Processor 800A MHz-M	1.12	1.08
Low Voltage Mobile Intel Pentium III Processor 850 MHz-M	1.16	1.11

Table 3 summarizes all Productivity, Multimedia, 3D Benchmarks/ Floating Point and Internet Technology benchmark performances of the Low Voltage and Ultra Low Voltage Mobile Intel Pentium III Processor-M, relative to that of the Low Voltage Mobile Intel Pentium III Processor at 733 MHz-M. A higher score indicates better performance.

Table 3. Low Voltage and Ultra Low Voltage Spectrum of Performance Benchmark Results with Intel 830M (Front Side Bus 133 MHz)

Processor	Productivity	Multimedia	3D Benchmark/ Floating Point	Internet Technology
	SYSmark*2001 on Windows XP	Video*2000 on Windows 2000	3D Winbench*2000 Processor Test on Windows 2000	WebMark*2001 on Windows XP
Low Voltage Mobile Intel Pentium III Processor 733 MHz-M	1.00	Not Available	Not Available	1.00
Low Voltage Mobile Intel Pentium III Processor 800 MHz-M	1.06	1.20	1.86	1.07
Low Voltage Mobile Intel Pentium III Processor 866 MHz-M	1.13	Not Available	Not Available	1.13

Appendix A System Configuration

Table 4. OEM System Configurations Used in Benchmark Tests

Processor	Mobile Intel Pentium III Processor-M at 866 MHz, 933 MHz, 1 GHz, 1.06 GHz, 1.13 GHz and 1.2 GHz
Notebook Used	Dell* Latitude C610
Processor System Bus Speed	133 MHz
System Memory Size/Speed	256-MB SDRAM PC133
Motherboard Chip Set	Intel 830MP
Hard Disk	IBM Travelstar* 20GN 4200 RPM 20.0 GB with 2MB cache buffer
Operating System	Windows 2000 Service Pack 2, FAT32
Sound	Crystal* WDM Audio Codec
Video Controller	ATI Radeon Mobility-M6* 16MB DDR SDRAM AGP4x graphics controller

Processor	Mobile Intel Pentium III Processor at 850 MHz and 1 GHz
Notebook Used	Dell* Latitude CPx
Processor System Bus Speed	100 MHz
System Memory Size/Speed	256-MB SDRAM PC100
Motherboard Chip Set	Intel 440BX
Hard Disk	IBM 4.8 GB*
Operating System	Windows 2000, Service Pack 2, FAT32
Sound	ESS Maestro-31*
Video Controller	ATI Rage Mobility-M1* AGP2x graphics controller

Processor	Mobile Intel Pentium III Processor at 500 MHz
Notebook Used	Dell* Latitude CPx
Processor System Bus Speed	100 MHz
System Memory Size/Speed	128-MB SDRAM PC100
Motherboard Chip Set	Intel 440BX
Hard Disk	IBM 4.8GB*
Media	Toshiba CD XM-1902B 24X*
Operating System	Windows 2000, Service Pack 2, FAT32
Sound	ESS Maestro-31*
Video Controller	ATI Rage Mobility-M1* AGP2x graphics controller

Processor	Ultra Low Voltage Mobile Intel Pentium III processor-M at 750, 700 MHz and Low Voltage Mobile Pentium III processor-M at 850, 800 MHz
System	Intel reference platform
Processor System Bus Speed	100 MHz
System Memory Size/Speed	256-MB SDRAM PC100
Motherboard Chipset	Intel 440MX
Hard Disk	IBM TravelStar MODEL 48GB 2MB 5400RPM FAT32
Operating System	Windows* XP; DirectX 8.10
Video Controller	ATI 3D Rage Pro PCI 8MB v5.1.2001.0

Processor	Low Voltage Mobile Intel Pentium III processor-M 733 , 800, 866, MHz
System	Intel reference platform
Processor System Bus Speed	133 MHz
System Memory Size/Speed	256-MB SDRAM PC133
Motherboard Chipset	Intel 830M
Hard Disk	IBM TravelStar MODEL 48GB 2MB 5400RPM FAT32
Operating System	Windows* XP; DirectX 8.10
Video Controller	Integrated Graphics

Processor	Ultra Low Voltage Mobile Intel Pentium III processor at 500/ 300 MHz
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Notebook Used	IBM iSeries 1124
Processor System Bus Speed	100 MHz
System Memory Size/Speed	192-MB SDRAM PC100
Motherboard Chipset	Intel 440MX
Hard Disk	IBM Travelstar, Size: 20GB, Model: DJSA-220
Operating System	Windows 2000, Service Pack 2, Fat32
Sound	Crystal SoundFusion™ CS4281 WDM Audio
Video Controller	Silicon Motion Lynx EM+

Appendix B Average Power

The Ultra Low Voltage and Low Voltage Mobile Intel Pentium III Processor-M and Mobile Intel Pentium III Processors featuring Intel SpeedStep technology consume the following average power:

Table 5. Average Power Measurements

Processor	Voltage	Average Power
Ultra Low Voltage Mobile Intel Pentium III Processor at 500/ 300 MHz ¹	0.975 V	< 0.5 W
Ultra Low Voltage Mobile Intel Pentium III Processor at 600/ 300 MHz ²	0.975 V	< 0.5 W
Ultra Low Voltage Mobile Intel Pentium III Processor-M at 700/ 300 MHz ³	0.95 V	< 0.5 W
Ultra Low Voltage Mobile Intel Pentium III Processor-M at 750/ 350 MHz ⁵	0.95 V	< 0.5 W
Low Voltage Mobile Intel Pentium III Processor at 750/ 500 MHz ⁶	1.10 V	< 1.0 W
Low Voltage Mobile Intel Pentium III Processor-M at 800A/ 500 MHz ⁷	1.05 V	< 1.0 W
Low Voltage Mobile Intel Pentium III Processor-M at 800/ 533 MHz ⁸	1.05 V	< 1.0 W
Low Voltage Mobile Intel Pentium III Processor-M at 850/ 500 MHz ⁹	1.05 V	< 1.0 W
Low Voltage Mobile Intel Pentium III Processor-M at 866/ 533 MHz ¹⁰	1.05 V	< 1.0 W

Definitions/Data

Average power represents the power consumed by the processor while running typical office applications by an average user. Average power is measured by running industry standard benchmarks, such as Ziff-Davis* BatteryMark* 4.0 measured in Battery Optimized Mode.

Configurations

Ultra Low Voltage Mobile Intel® Pentium® III featuring Intel® SpeedStep™ Technology at 500/ 300 MHz¹

Average Power of Intel processors were measured on an IBM notebook with the following configuration: 192-MB SDRAM, Intel 440MX chipset, 15-inch TFT active matrix display, Silicon Motion Lynx AGP graphics controller with 4-MB video RAM, 20-GB IBM TravelStar* disk drive, 3.5-inch floppy drive, Phoenix* BIOS, Windows* Millennium, ACPI enabled. Average power measured by running Ziff-Davis* BatteryMark 4.0. The measurements were taken at normal room temperature.

Ultra Low Voltage Mobile Intel® Pentium® III featuring Intel® SpeedStep™ Technology at 600/ 300 MHz²

Average power of Intel processors were measured on an Intel 815-EM based Reference Motherboard (Serial number 1254-1) with the following configuration: Mobile Intel Pentium III Ultra Low Voltage processor at 600/300MHz with IST technology (serial number 21037.017-13422), 64MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 256KB, Intel 815EM chipset (Internal UMA Graphics), 14" external CRT monitor, 4GB Toshiba* hard disk drive, Phoenix* Bios 4.0 Release 6.0 MPG-PDO 815-EM BIOS Version 0.59, Windows* 98 SE, ACPI enabled, average power measured by running Ziff-Davis* BatteryMark* 4.0. The measurements were taken at 50 degrees C temperature.

Ultra Low Voltage Mobile Intel® Pentium® III Processor-M featuring Intel® SpeedStep™ Technology at 700/ 300 MHz³

The above average power data represents single unit data. The Mobile Pentium III Processor-M power readings were measured on an Intel 440MX Customer Reference Board (Vicuna, Serial number INU7003941) with the

following configurations: Ultra Low Voltage Mobile Intel Pentium III Processor-M Processor at 700/300MHz with IST technology (serial number D113F033S8252), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, Trident* Providia9865 PCI graphics board, 15" external CRT monitor, Toshiba* MK2017GAP hard disk drive, Phoenix* Bios 4.0 Release 6.0 MPG-PDO Vicuna BIOS Version 1.02, Windows* 2000 operating system, ACPI enabled. The measurements were taken with the Mobile Pentium III Processor-M temperature controlled to 50 degrees C.

Ultra Low Voltage Mobile Intel® Pentium® III Processor-M featuring Intel® SpeedStep™ Technology at 750/ 350 MHz⁵

The above average power data represents single unit data. The Tualatin power readings were measured on an Intel 440MX Customer Reference Board (Vicuna, Serial number 00342) with the following configurations: Intel Mobile ULV Tualatin Processor at 750/350MHz with IST technology (serial number 35126119D1362), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, Guillemot Cougar PCI graphics board, 15" external CRT monitor, Toshiba* 4.3GB hard disk drive (s/n 10354937T), Phoenix* Bios 4.0, Release 6.0 MPG-PDO BIOS Version 1.02, Windows* 2000 operating system, ACPI enabled. The measurements were taken with the Tualatin temperature controlled to 50 degrees C.

Low Voltage Mobile Intel® Pentium® III featuring Intel® SpeedStep™ Technology at 750/ 500 MHz⁶

Average power of Intel processors were measured on an Intel 815-EM based Reference Motherboard (Serial number 1254-1) with the following configuration: Low Voltage Mobile Intel Pentium III Processor at 750/500MHz with IST technology (serial number 21036.013-02863), 64MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 256KB, Intel 815EM chipset (Internal UMA Graphics), 14" external CRT monitor, 4GB Toshiba* hard disk drive, Phoenix* Bios 4.0 Release 6.0 MPG-PDO 815-EM BIOS Version 0.59, Windows* 98 SE, ACPI enabled, average power measured by running Ziff-Davis* BatteryMark* 4.0. The measurements were taken at 50 degrees C temperature.

Low Voltage Mobile Intel® Pentium® III Processor-M featuring Intel® SpeedStep™ Technology at 800A/ 500 MHz⁷

The above average power data represents single unit data. The Mobile Pentium III Processor-M power readings were measured on an Intel 440MX Customer Reference Board (Vicuna, Serial number INU7003941) with the following configurations: Low Voltage Mobile Intel Pentium III Processor-M Processor at 800/500MHz with IST technology (serial number D111F038S0503), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, Trident* Providia9865 PCI graphics board, 15" external CRT monitor, Toshiba* MK2017GAP hard disk drive, Phoenix* Bios 4.0 Release 6.0 MPG-PDO Vicuna BIOS Version 1.02, Windows* 2000 operating system, ACPI enabled. The measurements were taken with the Mobile Pentium III Processor-M temperature controlled to 50 degrees C.

Low Voltage Mobile Intel® Pentium® III Processor-M featuring Enhanced Intel® SpeedStep™ Technology at 800/ 533 MHz⁸

The above average power data represents single unit data. The Mobile Pentium III Processor-M power readings were measured on an Intel 830MP Customer Reference Board (Serial number 46192) with the following configurations: Low Voltage Mobile Intel Pentium III Processor-M Processor at 800/533 MHz with IST technology (serial number D111F007S0239), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, integrated UMA graphics, 15" external CRT monitor, IBM* Travelstar* AHKS4583-IBM 31L9800 hard disk drive, Phoenix* Bios 4.0 Release 6.0 MPG-PDO 830M BIOS Version 0.56, Windows* 2000 operating systems, ACPI enabled. The measurements were taken with the Mobile Pentium III Processor-M temperature controlled to 50 degrees C.

Low Voltage Mobile Intel® Pentium® III Processor-M featuring Intel® SpeedStep™ Technology at 850/ 500 MHz⁹

The above average power data represents single unit data. The Tualatin power readings were measured on an Intel 440MX Customer Reference Board (Vicuna, Serial number 00342) with the following configurations: Intel Mobile LV Tualatin Processor at 850/500MHz with IST technology (serial number 35126119D1397), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, Guillemot Cougar PCI graphics board, 15" external CRT monitor, Toshiba* 4.3GB hard disk drive (s/n 10354937T), Phoenix* Bios 4.0 Release 6.0 MPG-PDO BIOS Version 1.02, Windows* 2000 operating system, ACPI enabled. The measurements were taken with the Tualatin temperature controlled to 50 degrees C.

Low Voltage Mobile Intel® Pentium® III Processor-M featuring Intel® SpeedStep™ Technology at 866/ 533 MHz¹⁰

The above average power data represents single unit data. The Tualatin power readings were measured on an Intel 830M Customer Reference Board (Serial number 00476) with the following configurations: Intel Mobile ULV Tualatin Processor at 866/533 MHz with IST technology (serial number 35126119D1452), 128MB SDRAM, System Memory 640KB, Extend RAM 32MB, Cache RAM 512KB, integrated UMA graphics, 15" external CRT monitor, Toshiba MK2017Gap SN 61C21756G hard disk drive, Phoenix* Bios 4.0, Release 6.0 MPG-PDO 830M BIOS Version 0.67, Windows* 2000 operating system, ACPI enabled. The measurements were taken with the Tualatin temperature controlled to 50 degrees C.

Disclaimer

Power measurements are generally taken by running certain performance and/or battery life benchmarks on a specific computer system. Different measurements can be designed to approximate the various power characteristics of a component such as a processor, or of a computer system. Some of the often-measured power characteristics include thermal design power (or TDP) and average power. Examples of benchmarks used to measure power include: Ziff-Davis* BatteryMark* 4.0 and BAPCo* SYSmark* 2000. Each processor's or system's power characteristics is measured using a particular computer system with specific hardware and software configuration. Such processors or computer systems may or may not be commercially available at the time when the measurements are taken but reasonable effort is made to make such measurements on processors and computer systems currently or soon-to-be commercially available. Where non-commercial systems are utilized for power measurements due to special instrumentation needs, reasonable effort is made to ensure that such non-commercial systems have characteristics, configurations, and properties similar to those of a computer system currently or soon-to-be commercially available, although such similarity cannot be guaranteed. Actual power measurement results may vary depending on the specific hardware and software configuration of the computer system measured, the power characteristics of those computer components not under direct measurement, variation in processor manufacturing processes, the benchmark utilized, the specific ambient condition under which the measurement is taken, and other factors. Buyers should consult other sources of information to evaluate the power characteristics of the systems they are considering purchasing. For more information about power characteristics (such as TDP or average power), and a description of the systems and microprocessors used in the power measurements, and any other information about processor and system performance and power benchmarks, visit Intel's World Wide Web site at <http://www.intel.com/design/mobile/perfbref/index.htm> or <http://developer.intel.com/design/mobile/perfbref/> and follow the appropriate links. © 2002 Intel Corporation.

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